MAP 8

SPHERES OF INFLUENCE

City Spheres of Influence

Grassland Wildlife Management Area

Grassland Water District

GWMA 1 mile sphere

GWMA 2 mile sphere

5 miles

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Merced

El Nido

Atwater

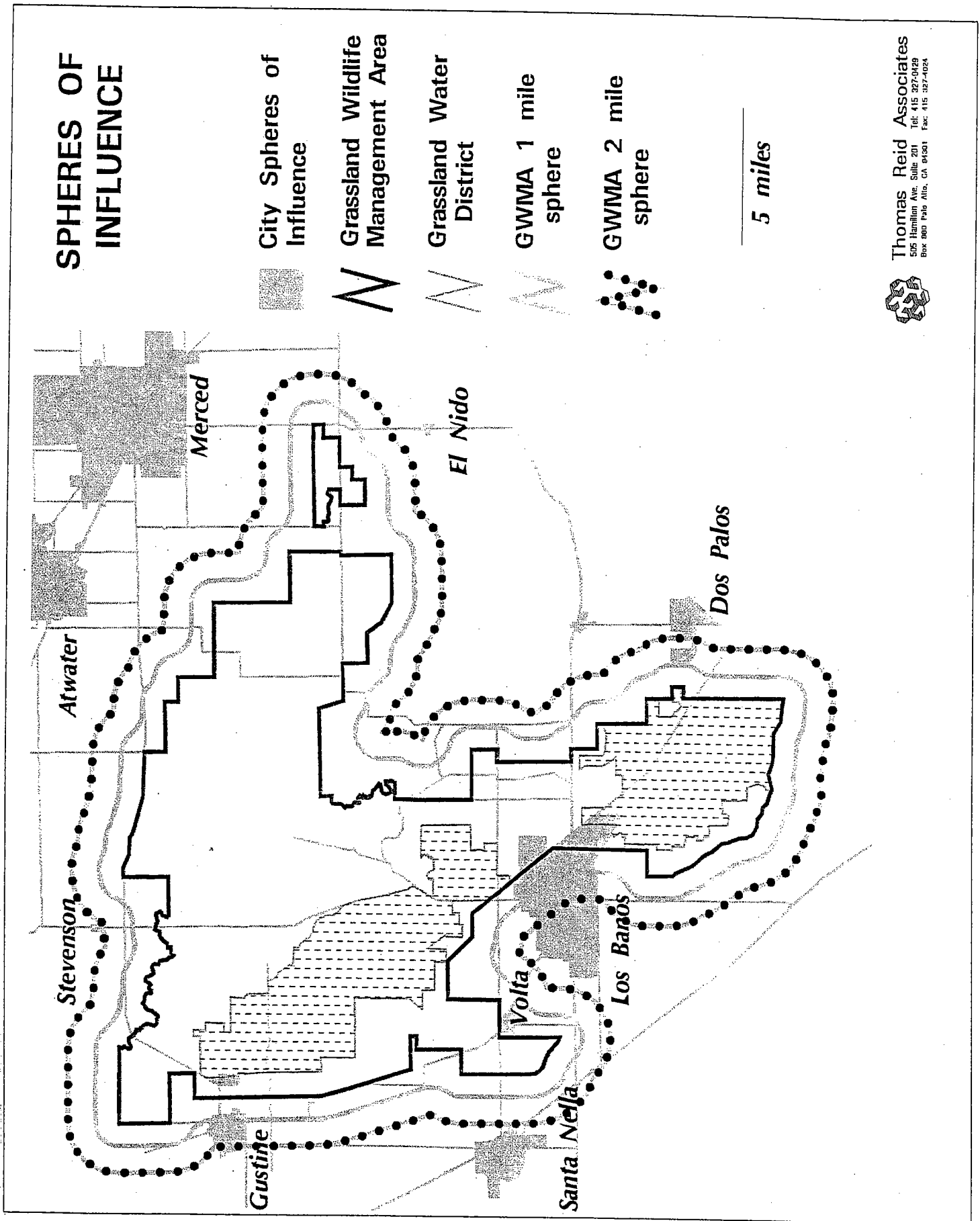Dos Palos

Stevenson

Los Banos

Volta

Santa Nella

Gustine

APPENDIX A.

Noss, R. F (1994) Translating Conservation Principles to Landscape Design for the Grasslands Water District.

Translating Conservation Principles to Landscape Design
for the Grassland Water District

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FINAL: May 1994

INTRODUCTION

"Although some wetlands are significantly altered or destroyed outright by a single activity during a short time period, most large wetland systems are impacted incrementally by many sources over longer periods of time." (Witmer 1985)

The wetland ecosystems of the Grasslands Management Area, known as the most valuable of the remaining wetlands in the Central Valley portion of the Pacific Flyway, are endangered by development and other human activities on surrounding and adjacent lands (Frederickson and Laubhan 1994). Like many semi-natural areas embedded in human-dominated landscapes, the Grasslands Management Area is threatened more by cumulative impacts that cross its boundaries and fragment its continuity than by outright destruction.

The values of wetlands are now generally accepted. Thus, society has afforded them some level of protection. However, the cumulative effects of diverse land-use activities on wetlands are imperceptible to most people. But they are no less real. Mitigating those impacts requires establishment of some kind of functional buffer zone between anthropogenic disturbances and natural ecosystems. It also requires that activities that might fragment wetlands and other natural or semi-natural habitats be strictly controlled, and that high levels of functional connectivity be maintained between wetlands and other areas important to wildlife.

Buffer zones and corridors are among the best accepted concepts in conservation, but a tremendous variety of buffers and linkages has been proposed. For example, in a recent review of the literature concerning riparian buffers and their functions at local scales, Johnson and Ryba (1992) observed that 38 separate investigators recommended buffer widths of 3 to 200 meters for different site-specific functions and disturbance types. On the other hand, the buffer zones recommended for national parks and other large natural areas, as in the biosphere reserve model, are often many miles in width (UNESCO 1974, Harris 1984, Noss 1987a, 1992, Hough 1988). For the Grasslands study area of approximately 179,500 acres (Frederickson and Laubhan 1994), we can assume that optimal buffer widths lie somewhere between these extremes, that is, probably more than 200 m but less than several miles. Determining optimal buffer widths and linkages to protect wetland ecosystems requires site specific review.

We examined the literature on wetland and riparian buffers and corridors with particular emphasis on issues surrounding the waterfowl habitat and the unique pressures of various land uses in the Central Valley of California. We also reviewed the general conservation biology literature related to habitat fragmentation and connectivity. Several databases were searched for relevant journal articles and technical reports: NTIS,

SELECTED WATER RESOURCES (SWRA) DATABASE, AGRICOLA, BIOLOGY & ENVIRONMENTAL SCIENCES, WILDLIFE REVIEW, BIOLOGICAL ABSTRACTS, and LIFE SCIENCES COLLECTION DATABASES. These databases were searched for keywords and subject. Keywords and phrases searched included wetland buffers, habitat buffers, waterfowl habitat, San Joaquin Valley habitat, San Joaquin wetlands, buffer width, cumulative impacts to wetlands, wildlife management, buffer characteristics, grazing and wetland/riparian, agriculture and wetland/riparian, urbanization and wetland/riparian, and others.

FRAGMENTATION OF WETLAND HABITAT AND THE NEED FOR CONNECTIVITY

The functions and features of wetlands and riparian zones overlap considerably, especially in regions such as the San Joaquin River Valley, where most wetlands are associated with riparian zones or stream systems. Characteristics of wetland/riparian areas that are vital to their habitat values for wildlife include high productivity and diversity of vegetation, early spring availability of forage for herbivores, available surface water and associated aquatic habitats, and the continuity and connectivity of these habitats that facilitates movement and migration of plants and animals (Schroeder and Allen 1992). Activities such as livestock grazing, residential development, and agricultural practices can decrease the diversity and ecological integrity of wetland communities and make them more susceptible to domination by a single vegetation type and invasion by weedy, non-native species. These changes inevitably reduce the value of the wetlands and riparian zones for native fauna and flora. Activities that fragment wetland areas make them more vulnerable to all these impacts.

Fragmentation of natural ecosystems is widely documented to have deleterious consequences. Connectivity--in many respects the opposite of fragmentation--can help keep natural ecosystems healthy in a landscape that is otherwise highly fragmented (Noss 1987b). We discuss these two topics each in turn.

Fragmentation

Fragmentation of wetland ecosystems by human activities does not differ substantially in effect from fragmemtation of other kinds of ecosystems. Habitat fragmentation is one of the greatest threats to biodiversity worldwide (Burgess and Sharpe 1981, Noss 1983, 1987a, Harris 1984, Wilcox and Murphy 1985). Fragmentation is often considered to have two components: (1) decrease in some habitat type or perhaps all natural habitat in a landscape; and (2) apportionment of the remaining habitat into smaller, more isolated pieces (Wilcove et al. 1986). Although the latter component is fragmentation per se, it usually occurs with deforestation or other massive habitat reduction (Harris 1984). An almost inevitable consequence of human settlement and resource extraction in a landscape is a patchwork of small, isolated natural areas in a sea of altered land.

Early fragmentation studies viewed the process as a species-area problem analogous to the formation of land-bridge islands as sea levels rose since the Pleistocene. Hence, island biogeographic theory (MacArthur and Wilson 1963, 1967) was invoked to explain losses of species as the area of habitats declined and their isolation increased. Certainly, there are good analogies between real islands and caves, lakes, prairies in a forested landscape, or pieces of remnant forest in agricultural land. But there are differences, too. The water that surrounds real islands provides habitat for few terrestrial species. In contrast, the matrix

(Whitcomb et al. 1981, Brittinghman and Temple 1983, Noss 1983, 1987a, Harris 1984, Wilcove et al. 1986, Harris and Silva-Lopez 1992, Noss and Csuti 1994). Deleterious edge effects commonly extend 50-200 m into a habitat from an edge, and in some cases much farther (Noss 1983, Wilcove et al. 1986, Noss and Cooperrider 1994).

The kind of fragmentation that poses the most immediate threat in the Grasslands Management Area is development activities (for example, intensification of agriculture, housing or golf course development) that create movement barriers between units of habitat used by wildlife. As noted by Frederickson and Laubhan (1994, p. 59), "clearly species with large home ranges have very few areas of suitable size for survival. Thus, a few additional activities resulting in fragmentation will impact many more species." For example, the north and south units of the Grasslands are separated by Highway 152. Roads are known to be movement barriers to many species of small animals (see review in Noss 1993 and Noss and Cooperrider 1994). Thus, the road already fragments the wetland ecosystem. However, a small strip of habitat adjacent to Mud Slough may provide a corridor (or, more accurately, a bottleneck in a natural corridor) along which some species will travel. Aquatic species will move along Mud Slough itself. The agricultural fields to the north of the highway are probably also used as travel routes for species such as the giant garter snake (Thamnophis gigas; many records of this species in this area are in the California Natural Diversity Data Base), though they are not suitable breeding habitat.

Any further fragmentation of this vulnerable linkage between the north and south units of the Grasslands Management Area could well provide the "final blow" in fragmenting the wetland ecosystem. Importantly, fragmentation is not a black-and-white, "either-or" situation. Rather, it is a relative and cumulative problem. After some threshold of fragmentation is exceeded, movement of individuals will no longer occur regularly enough to maintain the population of a fragmentation-sensitive species. Until detailed, long-term studies of species in the study area are performed, the prudent course is to prevent any further fragmentation of the system. Indeed, professional opinion among scientists is now firm that the burden of proof in such matters must rest on those who propose activities that may fragment or otherwise degrade ecosystems.

In addition to the many negative effects of fragmentation, as documented in various habitats around the world, wetland ecosystems are likely to suffer from disruptions of water flow and other hydrological impacts that accompany fragmentation. For example, drainage canals, dikes, and roads have had severe effects on the hydrology, vegetation, flora, and fauna of the Everglades (Kushlan 1979). Similarly, fragmentation has altered flow patterns and other aspects of hydrology in the Grasslands study area, but in ways that have not been well documented (Frederickson and Laubhan 1994).

Connectivity

Connectivity--or, in particular, corridors--is a complex and contentious issue among conservation biologists (Noss 1987b, Simberloff and Cox 1987, Hobbs 1992, Simberloff et al. 1992, Noss 1993). What conservation biologists are interested in is not simply some corridor we can recognize in the landscape or draw on a map, but rather functional connectivity. Functional connectivity is usually measured according to the potential for movement and population interchange of a target species. The degree of functional connectivity in a landscape or reserve network is influenced by many factors (Table 1; Noss and Cooperrider 1994).

Connectivity is not just corridors. For species that disperse in apparently random directions, such as the northern spotted owl (Thomas et al. 1990), connectivity is affected more by the suitability of the overall landscape matrix than by the presence or absence of discrete corridors. Also, not all linkages are functionally equivalent; some, such as narrow edge-dominated corridors, may do more harm than good by serving as mortality sinks (Henein and Merriam 1990). Some kinds of corridors (for example, roadsides) also create conservation problems, such as by facilitating the spread of weedy and exotic species (Noss 1993a). But other corridors, for example, riparian systems, are well accepted as critical movement routes for many wildlife species (Harris 1984, Noss and Harris 1986, Binford and Buchenau 1983).

Viewed from the perspective of land-use planning, connectivity is basically the opposite of fragmentation. In contrast to breaking landscapes into pieces, we seek ways to preserve existing connections and restore severed connections. Preserving existing connections is almost always a good idea. As argued by Hobbs (1992), "maintenance of existing linkages should be an important component of any conservation plan, on the basis that it is easier to retain them now than to replace them in the future." Thus, as noted above, in the absence of data to the contrary, the most prudent and conservative planning decision is to prohibit any further fragmentation of an ecosystem and maintain existing levels of connectivity.

Specifying the scale of connectivity being considered in a conservation plan is critical; the spatial scale would vary depending on the scale at which the target species disperse and travel about the landscape. Narrow fencerow corridors a few hundred feet in length form an appropriate scale for considering functional connectivity for rodent populations (Merriam 1988), whereas a multiple-use landscape 30 miles wide that lies between two national parks can be considered a corridor at a regional scale, if it functions as such for wide-ranging animals (Noss 1992).

Thus, linkages within the Grasslands Water District--such as the narrow corridor connecting the north and south units--are important to wildlife at a relatively fine scale determined by local population dynamics. The connectivity of the Grasslands within the system of natural and semi-natural habitats in the San Joaquin Valley and the entire Central Valley is important at a broader scale, as determined by movements of wider-ranging or migratory species. Finally, the role of remnant wetlands of the Central Valley in the Pacific Flyway corridor is critical at a still broader scale for migratory waterfowl (Frederickson and Laubhan 1994).

In landscapes where natural corridors have been destroyed and cannot easily be restored, reserves should ideally be very close together and not separated by insurmountable barriers (Diamond 1975, Thomas et al. 1990). For species, such as many small vertebrates and flightless invertebrates, that refuse to cross roads or other relatively narrow swaths of unsuitable habitat (Oxley et al. 1974, Mader 1984, Swihart and Slade 1984, Mader et al. 1990), continuous habitat linkages are needed both for movements within home ranges and for dispersal. In many cases, roads have been elevated (i.e., underpasses or tunnels created) to allow passage of wildlife underneath (Noss 1993).

Even in the absence of distinct movement barriers, sheer distance can make successful dispersal unlikely, even for species as mobile as large mammals. Thus, reserves separated by areas of unsuitable habitat longer than normal (mean or median) dispersal distances of target

of disturbance to the wetland (Cooke and Conneley 1990, Cooke 1992). The more developed the basin in which a wetland complex exists, the more potential deleterious impacts there are to the wetland (Ehrenfeld 1983, Cooke 1992). Thus, wetland conservation programs must not only consider protection of individual wetlands, but must also control the extent of development throughout the watershed or landscape in which wetlands exist.

Impacts of urban development on wetlands noted in the Puget Sound study (Cooke 1992) include (1) physical disruption, such as mowing and digging; (2) chemical disruption, including inputs of toxicants and fertilizers from lawns and roads; (3) competitive disruption from introduction of nonnative species; (4) noise disruption, for example from roads and lawnmowers; and (5) visible disruption, for instance removing the tree and shrub canopy that screens wetlands. Cooke (1992) found that buffer zone functions were reduced in direct proportion to the narrowness of the buffer. Buffers less than 50 feet wide showed a 90% increase in degradation after adjacent urbanization.

In a study of wetlands affected by development as compared to pristine sites, Ehrenfeld (1983) found that the developed sites tended to lose the herbaceous species component and exhibitied a decreased frequency of shrub species. This vegetation was replaced by species from surrounding geographic regions and exotics, a large number of which were vines. The resulting areas exhibited low habitat value and were degraded because of the exotic and weedy nature of the colonizers. Urbanization changed water chemistry and flow, and drastically altered the plant and animal communities of the wetlands. "One of the most important environmental changes (in wetlands draining developed lands) is the addition of nutrients to the nutrient poor ground and surface water as a result of urbanization" (Ehrenfeld 1983).

Because urbanization usually seems to cause more damage to adjacent wetlands than do other land uses, maintenance of a buffer zone (even if in agriculture, rather than natural habitat) between urban areas and wetlands is essential. Cooke (1992) found that the effectiveness of buffers in protecting adjacent wetlands depends on (1) the number of lots adjacent to the buffer (the fewer, the better); (2) the size of the buffer (the wider, the better); (3) the type of buffer (vegetation types that act as visual screens, physical barriers to humans, sediment filters, and chemical filters are preferred); and (4) ownership of the buffer (buffers owned by landowners who appreciate the purpose of the buffer remain more intact).

Wetland buffers and their characteristics

Wetland scientists generally agree that buffers are needed to protect wetland habitats. Wetland buffers not only have the potential to insulate wetlands from adverse effects of various land use activities, but in many instances they also form unique and valuable habitat in their own right (Brown et al. 1987).

Our examination of the Grasslands Management Area suggests that the buffer concept be viewed holistically. Among the potential functions of buffer zones are the following:

1. Capture key ecological factors (rare species occurrences, key watersheds, etc.) not included in core reserve due to financial, political, or other limitations. Ideally the most valuable sites are encompassed in the core reserve, but buffer zones might include areas of somewhat lesser value (less concentrated rare species occurrences, higher road density, greater past disturbance by humans, etc.).

2. Provide supplemental habitat (for instance, for foraging) for key species inhabiting the core reserve.

3. Serve as a true buffer or filter that protects sensitive habitats and species in core reserve from disruptive human influences and edge effects originating in the surrounding matrix.

4. Protect people and their domestic animals and plants from depredating large mammals that may reach relatively high densities in core reserves.

5. Serve as suitable and safe movement habitat for animals traveling between and among core reserves.

6. Serve as areas for developing, testing, and demonstrating land-use and management practices that are compatible with conservation of biodiversity.

Buffer zones should be as wide as necessary to accomplish these objectives, or at least some subset of them. Necessary width will vary depending on several factors:

a. Size of reserve. The relationship is usually inverse, in that very large reserves may not require buffer zones, whereas small reserves are subject to intense edge effects and need buffering.

b. Type and intensity of land use in matrix. For example, a wider buffer zone is indicated if the matrix is high-density residential as opposed to agricultural land-use.

c. Types and intensities of use expected in buffer zone. If hunting, for example, is expected to be intense in the buffer zone and species sensitive to hunting occur there, the zone should be wide enough that hunters do not penetrate far into the zone from access points along its periphery.

Two or more buffer zones may be advisable in some cases, with inner zones more strictly protected (e.g., lower road density, more restrictions on agrilcultural activities) than outer zones. This is the multiple-use module idea of Harris (1984; see also Noss and Harris 1986, Noss 1987b).

The width of buffer zone needed to protect wetlands is not easy to determine and must involve site-specific analysis. Since different wetlands have different values that people choose to protect, there is great variance in the proposed buffer width among wetlands and types of disturbance. Buffer zones must remain relatively intact for a long time to function effectively (Corbett and Lynch 1985).

The most common buffer widths that have been recommended for riparian systems are from 12 to 33 meters (40-100 feet) (Corbett and Lynch 1985). Wetland/riparian buffer widths of 33 meters (100 feet) or greater may be effective in maintaining water quality depending on the disturbance types in surrounding areas (Castelle et al. 1992).

However, recent research indicates that many buffers are too narrow to protect wetlands and aquatic habitats (Binford and Buchenau 1993). In King County, Washington, the 7.6 meter (25 foot) buffers commonly established around wetlands in urban settings failed

to prevent degradation of wetlands (Cooke 1992). Significant deposition of sediments eroded from agricultural fields in Maryland occurred 80 meters from a field into a riparian forest (Lowrance et al. 1988). Based on her study of wetlands in the New Jersey Pine Barrens, Ehrenfeld (1983) was convinced of the degrading effect of urbanized runoff, but saw the need for more research to determine whether conventional buffers are sufficient to prevent degradation of the wetlands. In their review of riparian corridors, Binford and Buchenau (1993) conclude that "80 to 100 meters would be a reasonable minimum range of buffer widths...if the objective were to reduce sediment load by 50 to 75 percent; wider corridors would be necessary for greater sediment removal."

As waterfowl habitats, wetland buffers should provide waterfowl nesting sites and food, and should meet behavioral requirements such as visual isolation and cover in proper configurations to avoid or reduce predation. As Kadlec and Smith (1992) note, a single vegetation type is not likely to provide the diverse habitats required by different species of waterfowl. "In describing optimum riparian habitat, we must recognize that what is optimum nesting habitat for a mallard (*Anas platyrhynchos*) is totally unacceptable for a killdeer (*Charadrius vociferus*)" (Kauffman, 1988). Hence there is a definite need for structural as well as community diversity of wetlands and their associated buffers. Habitat components that can be provided by buffers include plant species diversity, structural complexity, and shelter. Buffers can provide cover and nesting sites for those species that utilize a mix of wetland and upland areas.

In a study of Central Valley habitats, Hehnke and Stone (1978) observed that in spring and fall migrations, bird density and diversity were higher in riparian and associated vegetation than in riprapped slopes. In the same study, about 85% of the total number of birds using agricultural land were blackbirds and sparrows, which indicate a disturbed and impoverished community. Riparian vegetation appears to be the major factor controlling avian diversity and density in the Sacramento Basin. Wetlands and their associated buffers need to be productive enough to provide the 750-950 kg/ha of food necessary to support current waterfowl populations. There is some question whether the wetland resources of the Central Valley can sustain these needs (Heitmeyer et al. 1989). If riparian and wetland vegetation in the Central Valley is further modified, plant and animal diversity can be expected to decline.

Wetland size is an important factor for many species. However, wetlands of relatively small size can be useful to waterfowl and some other animal species if they are well buffered and connected to other wetlands. Sousa and Farmer (1983) estimated that the minimum habitat area for wood duck broods is about 10 acres. Wetlands smaller than 10 acres may be used when they are not isolated from other wetlands (i.e., as long as they are connected by buffered corridors). Wood ducks nest in tree cavities and need 20 acres of nesting habitat for each acre of brood rearing habitat. Sousa and Farmer (1983) suggested that buffers be established in relation to open water, specifically in a ratio 50-75% cover to 25-50% open water.

Studies of wildlife habitat use along wetland-upland ecotones provide additional guidance for buffer zone width. To maintain waterfowl habitat in wetland areas, Castelle et al. (1992) recognized the need to retain natural vegetation structure in an upland buffer extending out 182 meters (600 feet) from a wetland. In a study of wood ducks in Washington, nests were located from 0 to 350 meters (0 to 1149 feet) from open water; most were within 182 meters (600 feet) of open water (Milligan 1985). Optimum nest cover values

are assumed to occur within the first 250 meters from any given wetland (Milligan 1985). In a survey of Swainson's hawks in the Central Valley, Schlorff and Bloom (1984) found that 77% of the nesting territories that they surveyed were within 432 meters (1,500 feet) of riparian and wetland areas and were often found in valley oak (*Quercus lobata*) and Fremont cottonwoods (*Populus fremontii*) that averaged at least 12 meters in height.

An important function of buffer zones is to help insulate sensitive animals from human activity. Josselyn et al. (1989) noted that human activity within 53 meters (175 feet) of different waterbirds could disturb them and cause an evasive response. Buffers composed of high vegetation (2-3 meters) were noted to be moderately to highly effective. Aquatic species are also sensitive to anthropogenic disturbance. Studies of invertebrate interactions within wetland and riparian zones in California suggest that buffers of at least 30 meters are needed to protect the benthic community from impacts associated with timber harvesting (Newbold et al. 1980). Eng (1984) noted that broad habitat protection is more effective that single-species conservation programs for endangered, threatened, and rare invertebrates in California.

Finally, the total width of riparian vegetation retained is an important consideration, because many animal species associated with these communities are area- or edge-sensitive. For example, avian use of riparian and wetland corridors varies with corridor width. On the basis of bird population studies in Maryland and Delaware, Keller et al. (1993) recommended that riparian forests should be at least 100 meters wide to provide some nesting habitat for area-sensitive species.

These studies indicate that conventional, narrow buffer zones for wetlands are usually ineffective, and that wider zones of at least 100 meters are needed to meet minimal wildlife needs. However, even these widths assume that the buffer is in ideal natural habitat. Buffers degraded to some degree, such as by agricultural activity, probably need to be much wider. The extremely wide buffer zones (several miles) recommended for biosphere reserves (e.g., UNESCO 1974) are intended in part to serve as areas for demonstrating land-use practices and lifestyles that are compatible with biodiversity. Such a purpose would also seem appropriate for the lands surrounding the Grasslands Management Area.

Recommendation

Because most of the habitat bordering the Grasslands Management Area is currently in agricultural use, we can expect that this habitat zone will have to be wider than if it were in more natural condition in order to provide the values of buffer zones discussed above. Also, because the values and functions of these zones are diverse, we prefer the term **auxiliary habitat** to buffer zone in this case. Our working hypothesis is that this zone should be at least one mile wide around the Grasslands Management Area to provide these values and functions. Specifically:

1. Any additional development, especially urban, should be prohibited in the one-mile wide (or more) auxiliary habitat zone unless detailed ecological research demonstrates that the development will not compromise the habitat values.

2. As a general rule, any activity that fragments habitat or compromises existing connectivity should be prohibited or rigorously mitigated if the wildlife and ecological values of the Grassland Management Area are to be maintained.

3. In particular, the tenuous habitat linkage between the north and south units should not be further fragmented. Rather, restoration and other activities that enhance the linkage should be undertaken as feasible.

4. The auxiliary habitat zone around the Grasslands Management Area should be used to develop, test, and demonstrate agricultural practices that are compatible with wildlife and biodiversity values. Conservation easements or other agreements that foster agricultural practices conducive to native wildlife should be established. For example, selected fields can be left fallow.

5. Some of the agricultural land--especially in areas where wetland/riparian corridors are presently narrower than optimal--should be restored to wetland condition. Further research is needed to determine the location of priority restoration sites and the types of restoration practices needed.

Detailed studies of species of concern in the Grasslands Management Area are also needed to establish with greater certainty the auxiliary habitat width and levels of connectivity required, and the specific types of land use in these zones that are compatible with native wildlife. Critical information includes data on home range size, movements, and habitat preferences. Species of concern are listed in Table 2.

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Table 1. Determinants of functional connectivity (from Noss and Cooperrider 1994).

1. Mobility or dispersal characteristics of the target species

    a. species-specific habitat preferences for movement

    b. dispersal distance or scale of resource utilization

    c. rate of movement or dispersal (through various types of habitats)

2. Other autecological characteristics of the target species (e.g., preference for particular plant species or structural features of the habitat; feeding and nesting requirements; mortality risks)

3. Landscape context: Structural characteristics and spatial pattern of landscape (patch, corridors, matrix, mosaics)

4. Distance between patches of suitable habitat

5. Presence of barriers to movement (e.g., rivers, roads)

6. Interference from humans, predators, etc.

Table 2. Species of concern in the Grasslands study area.

A joint Federal/State/local government task force has been established to focus on Kern County (San Joaquin Valley), California, endangered species issues. The primary objective of the task force is to develop a plan to conserve listed and candidate species and their habitats. The planning area encompasses the known range of the blunt nosed leopard lizard (*Gambelia silus*), San Joaquin kit fox (*Vulpes macrotis mutica*) and giant kangaroo rat (*Dipodomys ingens*).

[cited in *Endangered Species, Technical Bulletin* vol. XIII(6-7): 3]

Listed species

Blunt-nosed leopard lizard, *Gambelia silus* (E) [habitat mitigation, *Endangered Species, Technical Bulletin*, May, 1987; habitat conservation under Farm bill, *Endangered Species, Technical Bulletin*, May, 1989.]

American peregrine falcon, *Falco peregrinus analus* (E)

San Joaquin kit fox, *Vulpes macrotis mutica* (E) [habitat mitigation, *Endangered Species, Technical Bulletin*, May, 1987.]

Fresno kangaroo rat, *Dipodomys nitratoides exilis* (E) [no references]

Giant kangaroo rat, *D. ingens* (E) [oil exploration concern, *Endangered Species, Technical Bulletin*, Sep. 1987]

Tipton kangaroo rat, *D. nitratoides nitratoides* (E) [approved listing, *Endangered Species, Technical Bulletin*, Aug. 1988]

Valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T) [mitigation of habitat loss, *Endangered Species, Technical Bulletin*, Mar, 1986]

Hoovers wooly-star, *Eriastrum hooveri* (T) [notes on threats to habitat, *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Giant garter snake, *Thamnophis gigas* (E)

Vernal pool fairy shrimp, *Branchinecta lynchi* (E)

Califonia linderiella, *Linderiella occidentalis* (E)

Candidate Species

California tiger salamander, *Ambystoma californiense* [no references]

Western spadefoot toad, *Scaphiopus hammondi hammondi* [no references]

Tricolored blackbird, *Agelaius tricolor* [no references]

White-faced ibis, *Plegadis chihi* [no references]

Mountain plover, *Charadrius montanus* [no references]

California horned lark, *Eremophila alpestris actia* [no references]

Loggerhead shrike, *Lanius ludovicianus* [no references]

Western snowy plover, interior population, *Charadrius alexandrinus nivosus* [no references]

Pacific western big-eared bat, *Plecotus townsendii townsendii* [no references]

Riparian brush rabbit, *Sylvilagus bachmani riparius* [no references]

San Joaquin Valley woodrat, *Veotoma fuscipes riparia* [no references]

San Joaquin dune beetle, *Coelus gracilis* [no references]

Ciervo aegialian scarab beetle, *Aegialia concinna* [no references]

Heartscale, *Atriplex cordulata* [notes on distibution *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Valley spearscale, *A. joaquiniana* [notes on distibution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Fleshy owl's clover, *Castilleja camperstris* [notes on distribution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Hispid bird's beak, *Cordylanthus molls* ssp. *hispidus* [notes on distribution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Delta coyote thistle, *Eryngium racemosum* [notes on distribution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Merced monardella, *Monardella leucocephala* [notes on distribution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Colusa grass, *Neostapfia colusana* [notes on distribution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

San Joaquin orcutt grass, *Orcuttia inaequalis* [notes on distribution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Arburua Ranch jewelflower, *Streptanthus insignis* ssp. *lyonii* [notes on distribution and threats *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California*]

Fig. 1. A model reserve network for a human-dominated region, consisting of core reserves, connecting corridors or linkages, and multiple-use buffer zones. Only two core reserves are shown, but a real system may contain many reserves. Outer buffer zones would allow a wider range of compatible human activities than inner buffer zones. In this example, an interregional corridor connects the system to a similar network in another natural region. Adapted from Noss (1992).

Human-Dominated Matrix

Outer Buffer

Inner Buffer

Core Reserve   Corridor   Core Reserve

Inter-Regional Corridor

Fig. 1. A model reserve network for a human-dominated region, consisting of core reserves, connecting corridors or linkages, and multiple-use buffer zones. Only two core reserves are shown, but a real system may contain many reserves. Outer buffer zones would allow a wider range of compatible human activities than inner buffer zones. In this example, an interregional corridor connects the system to a similar network in another natural region. Adapted from Noss (1992).
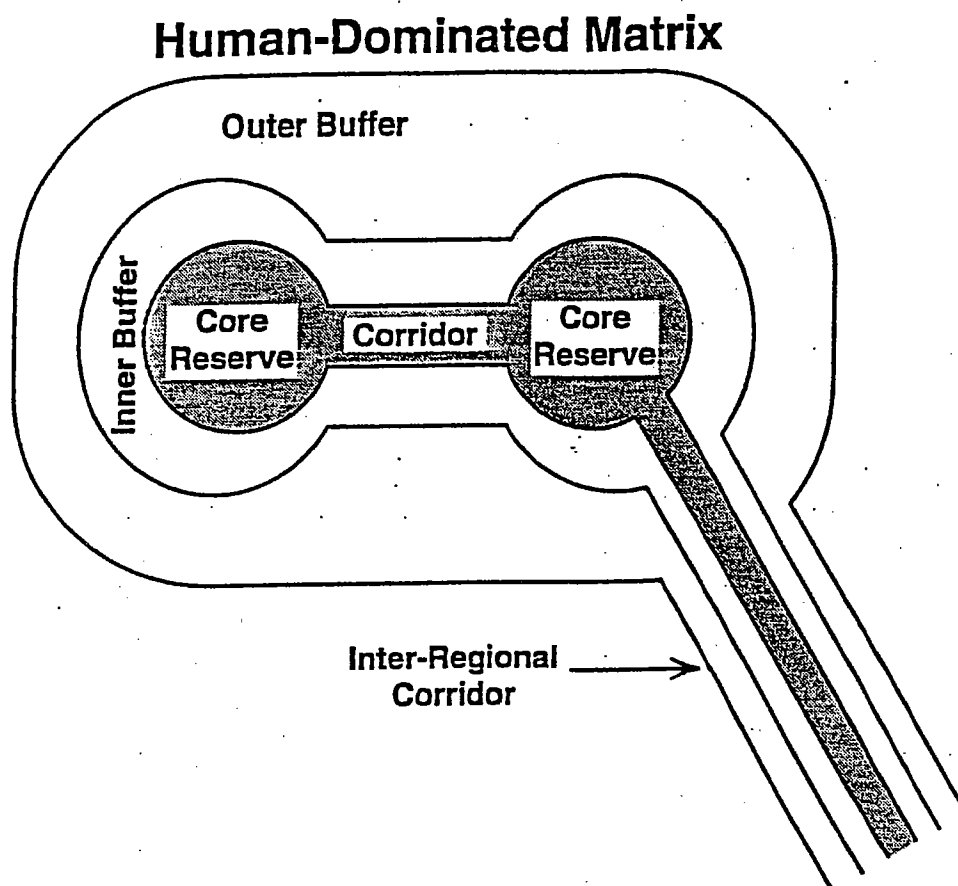
APPENDIX B.

      Extensive mapping of geographic information was used to support the recommendations of this study. The digital database, about 325 megabytes of data, includes maps and tabular data all georeferenced and essentially linked to each other. Map based data was translated, and converted as necessary for imput into UNIX based ARC/INFO. Tabular data were input into INFO or left in dos-based spreadsheets with each data item cross referenced to some ARC/INFO attribute (for example MAP INDEX in the Natural Diversity Database and PARCEL # in the Pesticide Permit Application from the Agricultural Commission)

      Below is a list of the coverages most used in the study, a listing of the contents of the the computer directories, and the code for each of the AML (ARC Macro Language) scripts used to generate the presentation maps. They are available in the /home/lgwd directory.

      All coverages are in the UTM projection, datum NAD27, meters. This allows them to be overlaid on the erdas image file (t4334gras.gis). The source of the data is in parenthesis. Items with an * have detailed code and annotation information in the Data Dictionary folder (ddf).

      Coverages preceeded with a # are also to be found as export files *.e00 files in /home/lgwd/arcview. These can be "ftp-ed" (File Transfer Protocol) over to dos for viewing and printing on Arcview.

ANNEX -potential annexations from the 1994 Los Banos General Plan. (TRA)
AINTEREST -expanded sphere of influence identified in 1994 Los Banos General Plan (TRA)
AIMPACT -an area identified for planning purposes in the 1994 Los Banos Beneral Plan, larger than AINTEREST, that includes the area that should be considered when implementing the general plan.
AROADS -all roads within the study area, the .aat has all street names that can be used in arcplot for labeling purposes or in arcedit (item = stname) to id.(MDSS)
BOOK428 * -parcels in Book428 refer to assessor book code, see below (MDSS)
CENSUS90 * -tiger census data for annotation code see data dictionary (TEALE/MDSS)
CORRCLIP - clip coverage to focus on the corridor area (TRA)
COUNTY-the county bnd (MDSS)
FLYLOC -flyover locations for pintail data, karen has joe's write-up about the data (NBB/JOE FLESCKES/TRA)
GENPLAN -outer boundary of general plans for all cities in Merced county(MDSS)
GGP -Gustine general plan with zoning info (MDSS)
GWD -Grassland Water District Boundary (MDSS)
GRIDPOPSP -Projected population coverage- not trnsferred into utm (MDSS)
WDONE -One mile buffer around GWD (TRA)
GWMA -Grassland Wildlife Management Area (MDSS)
GWMAONE- One mile buffer around GWMA (TRA)
GWMASA -Study Area = 2 mile buffer around Grassland Wildlife Manag (MDSS)
LBGP -Los Banos general plan with zoning info (MDSS)
LU90 -1990 Landuse (MDSS/DEPT OF CONSERVATION)
MROAD -main roads in the GWMA study area see aroads(MDSS)

MUNI -municipal boundaries for cities within Merced Co.(MDSS)
NDDB * -Natural Diversity Database point and polygon coverage for all CA rare, threatened and Endangered species. The associated file, nddbdata.df, an upload of the current RareFind database, is accessible only through tables. It is VERY important not to build or clean this coverage! More details are in ddf (CAF&G/NATURAL HERITAGE DIVISION)
NDDBLGWD -NDDB clipped to the corridor area. Unlike the CA wide NDDB this coverage has all the RareFind data directly associated with the arc coverage making it accessible to arcedit, arcplot and arcview. (CAF&G/NATURAL HERITAGE DIVISION/TRA)

The following coverages contain parcel data. Each is numbered with the county assessor book reference code. A map showing the locations of each these book numbers is in the ddf. The assessor's code includes contract (4242) and noncontract (4343) duck clubs, however this information is only available through the INFO datafile PINFO for all but the corridor focus area. The corridor focus area (PARCORR) has all associated code information embedded into it directly.

PARCORR - parcels in the corridor focus area, information from the INFO file PINFO, which can be accessed through TABLES, is already embedded in this coverage further work should include eliminating unneccesary code item in the pat (TRA/MDSS)
PAR20 (MDSS)
PAR25 (MDSS)
PAR26 (MDSS)
PAR40 (MDSS)
PAR45 (MDSS)
PAR49 (MDSS)
PAR54 (MDSS)
PAR55 (MDSS)
PAR56 (MDSS)
PAR59 (MDSS)
PAR63 (MDSS)
PAR64SP - a coverage that refused to be transformed to utm (MDSS)
PAR65 (MDSS)
PAR66 (MDSS)
PAR70 (MDSS)
PAR73 (MDSS)
PAR74 (MDSS)
PAR75 (MDSS)
PAR78 (MDSS)
PAR81 (MDSS)
PAR82 (MDSS)
PAR83 (MDSS)
PAR84 (MDSS)
PAR85 (MDSS)
PAR86 (MDSS)
PAR88 (MDSS)
PAR89 (MDSS)
PAR90 (MDSS)
PARCELSSP - Not transferred to utm, it is an appended file that shows all the arcs in all parcel coverages but has no associated information. (MDSS)

RESE -Reservoirs on the east side of the county(MDSS)
RESW -Reservoirs on the west side of the county(MDSS)
RIVERS - and creeks for the whole county, INFO file include names (item = HLNAME) (MDSS)
SEWERS -shows the sewage ponds for each of the municipalities (MDSS)
SPHERES -sphere of influence for each city (MDSS)
T4334GRAS -an arc/info coverage of the thematic mapper data classified to identify waterfowl habitat. We do not have a good remap table for it yet. The remap table (classlst.rmp) we were sent is not in a readily readable arc/info format. (DU)
T4334GRAS.GIS - an erdas image that shows the 7 waterfowl habitat types in false color and other landuse in straight red/blue/green TM bands. To use it as a base map give the command > image t4334gras.gis (DU)
TOPO15 - outlines of USGS 15' quads for the county (MDSS)
TOPO75 -outline of USGS 7.5' quads for the county(MDSS)
WETLAND - the 1977 National Wetland Inventory data. we have updated 1983 data from DU in /home/lgwd/temp/lisy listed by quad name. They did not send us annotation data, when Barbara comes back from Alaska she will correct this.(MDSS)
WETPOINTS - annotation data for each of the above wetland polygons. (MDSS)

The computer directory listings are also documented in the Data Dictionary.


```
/home/lgwd/tape2
gis1% ls -l
total 152
drwxr-xr-x  2 lgwd     staff        512 Nov  8 03:38 1.map
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:30 annex
drwxr-xr-x  2 lgwd     staff       1024 Nov  7 19:33 aroads
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:30 book428
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:31 census90
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:31 genplan
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:31 ggp
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:32 glanduse
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:32 gridpopsp
drwxr-xr-x  2 lgwd     staff       7680 Nov  8 02:52 info
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:32 lbdiff
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:33 lbgp94
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:33 line
-rw-r--r--  1 lgwd     staff       5993 Nov  8 03:39 log
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:33 lu90
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:32 ludwr
drwxr-xr-x  2 lgwd     staff        512 Nov  8 02:50 ludwrcs
drwxr-xr-x  2 lgwd     staff        512 Nov  8 02:50 ludwrdp
drwxr-xr-x  2 lgwd     staff        512 Nov  8 02:51 ludwrdr
drwxr-xr-x  2 lgwd     staff        512 Nov  8 02:51 ludwri
drwxr-xr-x  2 lgwd     staff        512 Nov  8 02:47 ludwrlb
drwxr-xr-x  2 lgwd     staff        512 Nov  8 02:48 ludwrsl
drwxr-xr-x  2 lgwd     staff        512 Nov  8 02:52 ludwrv
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:33 lulb
drwxr-xr-x  2 lgwd     staff       1024 Nov  7 19:33 mroads2
drwxr-xr-x  2 lgwd     staff        512 Nov  7 19:33 nopclip
```

```
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par20
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par25
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par26
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par40
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par45
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par49
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par54
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par55
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par56
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:33 par59
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par59sp
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par63
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par64
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par64sp
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par65
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par66
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par70
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par73
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par74
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par75
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par78
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par81
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par82
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par83
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par84
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par85
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par86
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:34 par88
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:35 par89
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:35 par90
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:35 parcorr
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:35 sewers
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:35 topo15
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:35 topo75
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:36 wetland
drwxr-xr-x  2 lgwd     staff       512 Nov  7 19:36 wetpoints
/home/lgwd
gis1% ls -l
total 214
drwxr-xr-x  2 lgwd     staff       512 Oct 11 16:05 ainterest
drwxr-xr-x  2 lgwd     staff      2048 Nov  7 15:36 amls
drwxr-xr-x  2 lgwd     staff       512 Oct 11 16:05 annex
drwxr-xr-x  2 lgwd     staff       512 Oct 14 17:31 close
drwxr-xr-x  2 lgwd     staff       512 Oct 11 16:05 gwmabndstxt
drwxrwxrwx  2 root     other     16384 Nov  8 02:14 info
-rwxrwxrwx  1 13102    20        61277 Nov  7 23:53 log
drwxr-xr-x  2 lgwd     staff       512 Oct 11 16:05 map1
-rw-r--r--  1 lgwd     staff       519 Oct 24 14:00 newcshrc2
-rw-r--r--  1 lgwd     staff       527 Oct 24 14:00 newcshrc2%
drwxr-xr-x  2 lgwd     staff       512 Oct 11 16:05 nop2.ps
```

```
-rw-r--r--   1 lgwd     staff        287 Aug 30 06:03 offmaps
-rw-r--r--   1 lgwd     staff        264 Aug 30 06:03 offmaps%
-rwxrwxrwx   1 lgwd     staff        373 Jul 15 21:37 oldcshrc1
drwxr-xr-x   2 lgwd     staff        512 Oct 11 16:05 page
drwxr-xr-x  46 lgwd     staff       2048 Nov  8 08:21 show
drwxr-xr-x  63 lgwd     staff       1536 Nov  8 03:39 tape2
drwxr-xr-x   3 lgwd     staff        512 Nov  1 17:00 temp
-rw-r--r--   1 lgwd     staff       2998 Jul 20 15:02 toprint
-rw-r--r--   1 lgwd     staff       2963 Jul 20 15:02 toprint%
drwxr-xr-x   2 lgwd     staff       1536 Nov  8 08:30 txt
drwxr-xr-x   3 lgwd     staff        512 Jul 21 15:38 utm
-rw-r--r--   1 lgwd     staff        936 Aug 12 13:15 wetnames
-rw-r--r--   1 lgwd     staff        124 Aug 12 13:15 wetnamex


/home/lgwd/show
gis1% ls -l
total 45074
drwxr-xr-x   2 lgwd     staff        512 Nov  8 03:43 1.map
-rw-r--r--   1 lgwd     staff   11559894 Nov  8 08:21 1.ps
-rw-r--r--   1 lgwd     staff       2073 Nov  1 17:06 1intro.aml
-rw-r--r--   1 lgwd     staff       7649 Nov  8 01:25 1present.aml
-rw-r--r--   1 lgwd     staff       7654 Nov  8 01:25 1present.aml%
-rw-r--r--   1 lgwd     staff       2578 Nov  8 03:16 2image.aml
-rw-r--r--   1 lgwd     staff       2564 Nov  8 03:16 2image.aml%
-rw-r--r--   1 lgwd     staff       2563 Nov  8 03:21 3close.aml
-rw-r--r--   1 lgwd     staff       2418 Nov  8 03:21 3close.aml%
-rw-r--r--   1 lgwd     staff       1657 Nov  8 00:02 4shorebird.aml
-rw-r--r--   1 lgwd     staff       1641 Nov  8 00:02 4shorebird.aml%
-rw-r--r--   1 lgwd     staff       2088 Nov  8 03:27 5mapfly.aml
-rw-r--r--   1 lgwd     staff       2023 Nov  8 03:27 5mapfly.aml%
-rw-r--r--   1 lgwd     staff       1746 Nov  8 00:07 5prnt.aml
-rw-r--r--   1 lgwd     staff       1747 Nov  8 00:07 5prnt.aml%
drwxr-xr-x   2 lgwd     staff        512 Nov  8 01:49 5prnt.map
-rw-r--r--   1 lgwd     staff    2181770 Nov  8 01:53 5prnt.ps
-rw-r--r--   1 lgwd     staff       1534 Nov  8 03:29 6nddb.aml
-rw-r--r--   1 lgwd     staff       1545 Nov  8 03:29 6nddb.aml%
-rw-r--r--   1 lgwd     staff        574 Nov  8 00:30 6prnt.aml
-rw-r--r--   1 lgwd     staff        574 Nov  8 00:30 6prnt.aml%
drwxr-xr-x   2 lgwd     staff        512 Nov  8 01:49 6prnt.map
-rw-r--r--   1 lgwd     staff     207930 Nov  8 01:54 6prnt.ps
-rw-r--r--   1 lgwd     staff       1926 Nov  1 17:08 7lbgp.aml
-rw-r--r--   1 lgwd     staff        393 Nov  8 00:49 7prnt.aml
-rw-r--r--   1 lgwd     staff        424 Nov  8 00:49 7prnt.aml%
drwxr-xr-x   2 lgwd     staff        512 Nov  8 01:49 7prnt.map
-rw-r--r--   1 lgwd     staff    1539716 Nov  8 01:55 7prnt.ps
-rw-r--r--   1 lgwd     staff       1874 Nov  1 17:08 8biosph.aml
-rw-r--r--   1 lgwd     staff       1057 Nov  8 01:10 8prnt.aml
-rw-r--r--   1 lgwd     staff       1037 Nov  8 01:05 8prnt.aml%
drwxr-xr-x   2 lgwd     staff       1024 Nov  8 01:48 8prnt.map
-rw-r--r--   1 lgwd     staff    2154819 Nov  8 01:59 8prnt.ps
```

```
-rw-r--r--   1 lgwd    staff        1052 Nov  8 01:26 8sph.aml
-rw-r--r--   1 lgwd    staff        1039 Nov  8 01:26 8sph.aml%
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 aimpact
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:24 ainterest
drwxr-xr-x   2 lgwd    staff        2048 Nov  8 01:00 amls
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 canals
drwxr-xr-x   2 lgwd    staff         512 Nov  7 23:59 close.map
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 county
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 flyloc
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 gp94lb
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 gwd
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:27 gwdone
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 gwma
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 gwmabnds
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 gwmabndstxt
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:27 gwmaone
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 gwmasa
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 gwmasph
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 hth
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 hyd100k
drwxr-xr-x   2 lgwd    staff         512 Nov  8 02:00 image.map
-rw-r--r--   1 lgwd    staff     1794898 Nov  8 02:00 image.ps
drwxr-xr-x   2 lgwd    staff        4608 Nov  7 19:24 info
drwxr-xr-x   2 lgwd    staff         512 Nov  8 01:48 intro.map
-rw-r--r--   1 lgwd    staff      224877 Nov  8 01:50 intro.ps
drwxr-xr-x   2 lgwd    staff         512 Nov  8 01:49 lbgp.map
-rw-r--r--   1 lgwd    staff      206810 Nov  8 01:52 lbgp.ps
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 lbgp90
-rw-r--r--   1 lgwd    staff      228579 Nov  1 17:01 lgwd-p01.tif
-rw-r--r--   1 lgwd    staff      197570 Nov  1 17:01 lgwd-p02.tif
-rw-r--r--   1 lgwd    staff      212565 Nov  1 17:01 lgwd-p03.tif
-rw-r--r--   1 lgwd    staff      164399 Nov  1 17:01 lgwd-p04.tif
-rw-r--r--   1 lgwd    staff      254796 Nov  1 17:01 lgwd-p05.tif
-rw-r--r--   1 lgwd    staff      177136 Nov  1 17:01 lgwd-p06.tif
-rw-r--r--   1 lgwd    staff      206385 Nov  1 17:01 lgwd-p07.tif
-rw-r--r--   1 lgwd    staff      222594 Nov  1 17:01 lgwd-p08.tif
-rw-r--r--   1 lgwd    staff      233622 Nov  1 17:01 lgwd-p09.tif
-rw-r--r--   1 lgwd    staff      191703 Nov  1 17:01 lgwd-p10.tif
-rw-r--r--   1 lgwd    staff      189434 Nov  1 17:01 lgwd-p11.tif
-rw-r--r--   1 lgwd    staff        3349 Nov  8 08:21 log
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 lu90corr
drwxr-xr-x   2 lgwd    staff         512 Nov  8 01:49 mapfly.map
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 mrnames
drwxr-xr-x   2 lgwd    staff        1024 Nov  7 19:26 mroads
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 muni90lb
drwxr-xr-x   2 lgwd    staff         512 Nov  8 01:49 nddb.map
-rw-r--r--   1 lgwd    staff      364788 Nov  8 01:51 nddb.ps
drwxr-xr-x   2 lgwd    staff         512 Nov  7 19:26 nddbshow
-rw-r--r--   1 lgwd    staff         431 Nov  8 01:48 prnt.aml
-rw-r--r--   1 lgwd    staff         438 Nov  8 01:48 prnt.aml%
```

```
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 public
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 rese
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 resw
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 rivers
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 roadsgp94
-rw-r--r--   1 lgwd      staff      163066 Nov  8 01:50 shbrd.ps
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 shorebird
drwxr-xr-x   2 lgwd      staff         512 Nov  8 01:48 shorebird.map
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 spheres
drwxr-xr-x   2 lgwd      staff         512 Nov  7 19:26 t4334


gis1% pwd
/home/lgwd/txt
gis1% ls -l
total 1118
-rw-r--r--   1 lgwd      staff         735 Nov  8 09:32 1draw.aml
-rw-r--r--   1 lgwd      staff         732 Nov  8 09:32 1draw.aml%
-rwxrwxrwx   1 lgwd      staff         293 Jul 17 12:07 arcprbl.txt
-rw-r--r--   1 lgwd      staff       28530 Aug 15 11:21 chronlgwd.txt
-rw-r--r--   1 lgwd      staff       37666 Aug 15 11:21 chronlgwd.txt%
-rw-r--r--   1 lgwd      staff         585 Aug 12 13:36 chronmap.txt
-rw-r--r--   1 lgwd      staff         348 Sep  2 13:03 conversions.txt
-rw-r--r--   1 lgwd      staff         307 Sep  2 13:03 conversions.txt%
-rw-r--r--   1 lgwd      staff        5480 Nov  8 08:30 covdoc.dos
-rw-r--r--   1 lgwd      staff        5365 Nov  8 03:32 covdoc.txt
-rw-r--r--   1 lgwd      staff        5374 Nov  8 03:32 covdoc.txt%
-rw-r--r--   1 lgwd      staff         396 Jul 26 00:59 covlst.txt
-rw-r--r--   1 lgwd      staff         396 Jul 26 00:58 covlst.txt%
-rw-r--r--   1 lgwd      staff        5743 Jul 22 18:47 doc.txt
-rw-r--r--   1 lgwd      staff        3086 Jul 26 02:06 hanson.txt
-rwxrwxr-x   1 root      other       26030 Jul 15 12:02 hplaser4.txt
-rw-r--r--   1 lgwd      staff       15587 Aug 16 10:36 hydtext
-rw-r--r--   1 lgwd      staff        3169 Jul 26 02:06 lgwd0723.txt%
-rw-r--r--   1 lgwd      staff        2331 Nov  7 18:21 lgwdnddb.aml
-rw-r--r--   1 lgwd      staff         869 Nov  7 18:29 lgwdnddb2.aml
-rw-r--r--   1 lgwd      staff        2331 Nov  7 18:29 lgwdnddb2.aml%
-rw-r--r--   1 lgwd      staff        3016 Aug 18 19:54 memo0816.txt
-rw-r--r--   1 lgwd      staff        2436 Aug 18 19:54 memo0816.txt%
-rw-r--r--   1 lgwd      staff       16548 Jun 10 11:41 nddb.txt
-rw-r--r--   1 lgwd      staff       10750 Aug 29 12:56 nddbAAT
-rw-r--r--   1 lgwd      staff        2151 Aug 29 13:04 nddbcheck
-rw-r--r--   1 lgwd      staff        3797 Aug 29 13:01 nddbfix
-rw-r--r--   1 lgwd      staff        3827 Aug 29 13:01 nddbfix%
-rw-r--r--   1 lgwd      staff        1929 Aug 29 12:24 nddbfix2
-rw-r--r--   1 lgwd      staff        3827 Aug 29 12:24 nddbfix2%
-rw-r--r--   1 lgwd      staff        2487 Aug 29 12:48 nddbfix3
-rw-r--r--   1 lgwd      staff        2521 Aug 29 12:47 nddbfix3%
-rw-r--r--   1 lgwd      staff       15821 Aug 29 13:03 nddbpat
-rwxrwxrwx   1 lgwd      staff        1103 Jul 17 12:07 problems
```

```
drwxr-xr-x   2 lgwd      staff       512 Sep 28 13:28 volta-a


/home/lgwd/amls
gis1% ls -l
total 332
-rw-r--r--   1 lgwd      staff      2097 Nov  7 21:46 1intro.aml
-rw-r--r--   1 lgwd      staff      2095 Nov  7 21:46 1intro.aml%
-rw-r--r--   1 lgwd      staff      7241 Nov  7 21:30 1present.aml
-rw-r--r--   1 lgwd      staff      7240 Nov  7 21:30 1present.aml%
-rw-r--r--   1 lgwd      staff      2325 Nov  1 13:16 2image.aml
-rw-r--r--   1 lgwd      staff      2321 Nov  1 13:16 2image.aml%
-rw-r--r--   1 lgwd      staff      3352 Oct  3 11:12 2present.aml
-rw-r--r--   1 lgwd      staff      3352 Oct  3 11:12 2present.aml%
-rw-r--r--   1 lgwd      staff       276 Aug 19 18:31 2t1precision2.aml
-rw-r--r--   1 lgwd      staff       842 Aug 19 18:31 2t1precision2.aml%
-rw-r--r--   1 lgwd      staff      1352 Aug 19 16:30 2to1precision
-rw-r--r--   1 lgwd      staff       842 Aug 19 16:30 2to1precision%
-rw-r--r--   1 lgwd      staff       842 Aug 19 16:23 2to1precision.aml
-rw-r--r--   1 lgwd      staff      2418 Oct  4 11:34 3close.aml
-rw-r--r--   1 lgwd      staff      2809 Oct  4 11:34 3close.aml%
-rw-r--r--   1 lgwd      staff      1641 Oct 13 17:42 4shorebird.aml
-rw-r--r--   1 lgwd      staff      1614 Oct 13 17:42 4shorebird.aml%
-rw-r--r--   1 lgwd      staff      1776 Oct  4 13:03 5mapfly.aml
-rw-r--r--   1 lgwd      staff      1776 Oct  4 13:03 5mapfly.aml%
-rw-r--r--   1 lgwd      staff      1545 Oct  4 14:10 6nddb.aml
-rw-r--r--   1 lgwd      staff      1629 Oct  4 14:10 6nddb.aml%
-rw-r--r--   1 lgwd      staff      1926 Nov  1 13:10 7lbgp.aml
-rw-r--r--   1 lgwd      staff       765 Nov  1 13:10 7lbgp.aml%
-rw-r--r--   1 lgwd      staff      1874 Nov  1 14:41 8biosph.aml
-rw-r--r--   1 lgwd      staff      1874 Nov  1 14:41 8biosph.aml%
-rw-r--r--   1 lgwd      staff      1963 Nov  7 15:39 8biospha.aml
-rw-r--r--   1 lgwd      staff      1926 Nov  7 15:39 8biospha.aml%
-rw-r--r--   1 lgwd      staff      1881 Nov  1 14:14 8sphere.aml
-rw-r--r--   1 lgwd      staff      1153 Nov  1 14:14 8sphere.aml%
-rwxrwxrwx   1 13108     staff        66 Jun 15 09:50 apnrel.aml
-rw-r--r--   1 lgwd      staff       405 Jul 25 22:18 build1.aml
-rw-r--r--   1 lgwd      staff      1041 Oct 13 17:47 clear.aml
-rw-r--r--   1 lgwd      staff       165 Oct 13 17:47 clear.aml%
-rw-r--r--   1 lgwd      staff      1187 Nov  1 17:10 clearif.aml
-rw-r--r--   1 lgwd      staff      1165 Nov  1 17:10 clearif.aml%
-rwxrwxrwx   1 lgwd      staff      1091 Jul 18 14:44 copy.aml
-rwxr-xr-x   1 lgwd      staff      1096 Jul 18 14:44 copy.aml%
-rw-r--r--   1 lgwd      staff      1085 Nov  1 16:40 copy2tape1.aml
-rw-r--r--   1 lgwd      staff      2562 Nov  1 18:30 copy2tape2.aml
-rw-r--r--   1 lgwd      staff      2674 Nov  1 18:30 copy2tape2.aml%
-rw-r--r--   1 lgwd      staff      1697 Nov  1 16:38 copytape1.aml
-rw-r--r--   1 lgwd      staff      1704 Nov  1 16:38 copytape1.aml%
-rw-r--r--   1 lgwd      staff      2817 Nov  1 17:41 copytape2.aml
-rw-r--r--   1 lgwd      staff      2817 Nov  1 17:41 copytape2.aml%
```

```
-rw-r--r--   1 lgwd     staff      1316 Aug 19 19:02 export.aml
-rw-r--r--   1 lgwd     staff      1314 Aug 19 19:02 export.aml%
-rw-r--r--   1 lgwd     staff      1341 Jul 26 00:58 export1.aml
-rw-r--r--   1 lgwd     staff       271 Aug 19 19:21 export2.aml
-rw-r--r--   1 lgwd     staff       350 Aug 19 19:21 export2.aml%
-rwxrwxrwx   1 13102     20        1911 May 19 09:10 flyloc.aml
-rwxrwxrwx   1 13102     20        1760 May 19 09:10 flyloc.aml%
-rw-r--r--   1 lgwd     staff       648 Sep 28 11:09 heading.aml
-rw-r--r--   1 lgwd     staff       756 Sep 28 11:09 heading.aml%
-rw-r--r--   1 root     other       361 Sep 27 18:14 intro.aml
-rw-r--r--   1 lgwd     staff       361 Sep 28 11:07 intro.aml%
-rw-r--r--   1 lgwd     staff      3441 Sep 30 16:44 intro1.aml%
-rw-r--r--   1 lgwd     staff       527 Oct 11 13:28 kill1011
-rw-r--r--   1 lgwd     staff       527 Oct 11 13:28 kill1011.aml
-rw-r--r--   1 lgwd     staff      1397 Sep 28 11:18 lgwdprsnt.aml
-rw-r--r--   1 lgwd     staff      1130 Sep 28 11:18 lgwdprsnt.aml%
-rw-r--r--   1 lgwd     staff       816 Aug 15 12:33 lutxt.aml
-rw-r--r--   1 lgwd     staff       847 Aug 15 12:33 lutxt.aml%
-rw-r--r--   1 lgwd     staff       534 Aug 12 15:33 nddbsym.aml
-rw-r--r--   1 lgwd     staff       843 Aug 12 15:33 nddbsym.aml%
-rw-r--r--   1 lgwd     staff       295 Aug 15 20:46 parcorrlu.aml
-rw-r--r--   1 lgwd     staff       286 Aug 15 20:46 parcorrlu.aml%
-rw-r--r--   1 lgwd     staff      3310 Sep 30 18:01 present.aml
-rw-r--r--   1 lgwd     staff      3306 Sep 30 18:01 present.aml%
-rw-r--r--   1 lgwd     staff       261 Aug 19 18:57 rename.aml
-rw-r--r--   1 lgwd     staff       363 Aug 19 18:57 rename.aml%
-rw-r--r--   1 lgwd     staff       948 Jul 24 14:32 rename1.aml
-rw-r--r--   1 lgwd     staff      1104 Jul 24 14:32 rename1.aml%
-rw-r--r--   1 lgwd     staff        22 Aug 28 12:36 rmvmaps.aml
-rw-r--r--   1 lgwd     staff        45 Aug 28 12:36 rmvmaps.aml%
-rw-r--r--   1 lgwd     staff       128 Nov  1 12:00 sp_utm.prj
-rw-r--r--   1 lgwd     staff       106 Nov  1 12:00 sp_utm.prj%
-rw-r--r--   1 lgwd     staff      1273 Aug 19 18:58 u2dscr
-rw-r--r--   1 lgwd     staff      1273 Aug 19 18:58 u2dscr%
-rw-r--r--   1 lgwd     staff      2620 Jul 23 16:59 utm.aml
-rw-r--r--   1 lgwd     staff      2677 Jul 23 16:59 utm.aml%
-rw-r--r--   1 lgwd     staff       663 Jul 23 18:05 utm2.aml


/home/lgwd/tape2/ludwr
gis1% ls -l
total 11716
-rw-r--r--   1 lgwd     staff    126304 Jul 22 14:25 lu3828.e00
-rw-r--r--   1 lgwd     staff    303813 Jul 22 14:26 lu3829.e00
-rw-r--r--   1 lgwd     staff    242076 Jul 22 14:26 lu3830.e00
-rw-r--r--   1 lgwd     staff    427243 Jul 22 14:26 lu3831.e00
-rw-r--r--   1 lgwd     staff    906203 Jul 22 14:27 lu3832.e00
-rw-r--r--   1 lgwd     staff    192711 Jul 22 14:28 lu3929.e00
-rw-r--r--   1 lgwd     staff    150142 Jul 22 14:28 lu3930.e00
-rw-r--r--   1 lgwd     staff    308194 Jul 22 14:28 lu3932.e00
```

```
-rw-r--r--   1 lgwd    staff    679852 Jul 22 14:29 lu3933.e00
-rw-r--r--   1 lgwd    staff    538810 Jul 22 14:29 lu4029.e00
-rw-r--r--   1 lgwd    staff    557514 Jul 22 14:29 lu4030.e00
-rw-r--r--   1 lgwd    staff    729274 Jul 22 14:30 lu4031.e00
-rw-r--r--   1 lgwd    staff    287119 Jul 22 14:31 lu4130.e00
-rw-r--r--   1 lgwd    staff    363610 Jul 22 14:31 lu4131.e00
-rw-r--r--   1 lgwd    staff      1938 Jul 22 14:32 reidlanduse.list
```

The USFWS map showing detailed info (regarding irrigation, shcedules, locations of ditches, etc) for all conservation easement properties remains in its DOS-AutoCAD format.